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TITLE:

Integrated low K dielectrics and etch stops

Detailed Description Text - DETX (67):

For selective etching, the volumetric flow ratio of fluorocarbon/carbon:oxygen gases is selected so the rate of formation of passivating deposits on the surfaces of the freshly etched features is different for the different low k dielectric materials. For the dielectric material having the faster etch rate, the rate of formation of passivating deposits is approximately equal to the rate of removal of the passivating deposits. For the low dielectric material having the slower etch rate, the rate of formation of passivating deposits exceeds the rate of removal of the passivating deposits. This provides high etching selectivity ratios, for example, an etching selectivity ratio of at least about 3:1, while simultaneously etching the dielectric layer at a high etch rate of at least about 400 nm/min, and more typically from 600 to 900 nm/min, with reduced etch rate microloading. When the substrate comprises an underlayer of material below the dielectric layer, such as silicon nitride or silicon carbide, the volumetric flow ratio of fluorocarbon/carbon:oxygen gas can be tailored to increase etching selectivity ratios for specific combinations of materials, such as for example, the etching selectivity of etching dielectric to resist, diffusion barrier layers, or anti-reflective layers. The volumetric flow ratio of fluorocarbon/carbon:oxygen containing gas can also be adjusted so that the sidewalls of the etched features have smooth surfaces that form angles of at least about 87 degrees with the surface of the dielectric layer on the substrate. The volumetric flow ratios can be tailored for different combinations of materials, and feature geometry, such as feature aspect ratios, to achieve specific etching selectivities, etch rate microloading, or etch rates without deviating from the scope of the present invention.